Panel Meters

FEMA ELECTRÓNICA

Series M40

Panel meter 96x48mm

Model M40-A

TrueRMS AC Voltages
TrueRMS AC Currents

Panel meter for TrueRMS measures of AC voltages and AC currents. Measure category in CAT-III up to 300Vac and CAT-II up to 600Vac. Current ranges up to 5Aac. Measure coupling selectable in AC or AC+DC. Housing 96x48mm DIN standard. Display in 4 or 5 digits. Maximum and minimum display memory, scalable reading, filters, steps, signal autocorrection, "measure" function, peak&hold, alarms with double setpoints, 5 levels of brightness, ... Universal AC and DC power modules and up to 3 modules for signal retransmission and control.

USER'S MANUAL
(2144R00)

Meter M40-A

Panel meter 96x48mm size for TrueRMS VAC and AAC

Panel meter for TrueRMS measure of AC voltages and AC currents. Measure category in CAT-III up to 300Vac and CAT-II up to 600Vac. Currents up to 5Aac. Measure coupling selectable in “AC” or “AC+DC”. Scalable reading.

Instrument with 96x48mm standard DIN size. Resolution 4 digits plus negative sign (“*-9999*”) or 5 digits with negative sign with last digit fixed to zero (“*99990*”, with menu function “*Right Zero*”).

Management for up to 4 alarms with 1 or 2 setpoints each, with hysteresis and delays. Provides memory for maximum and minimum, left zeros, display on selectable steps, fixed digits, recursive display filter, password, brightness control, “*measure*” function (visualizes input signal without scaling), offset and signal high autocorrection (assigns the actual signal to the low or high reading), “*peak&hold”* function and password.

Power options with universal AC and DC ranges, and space for three additional control and/or signal retransmission modules.

For measurements in CAT-III (depends on the range selected) and for environments with pollution degree 1 and 2 without condensation. Standard IP54 front protection, with optional upgrade to IP65 protection.

Connections via plug-in screw terminals and configuration via three front push-buttons. For application on industrial environments.

Order Reference

	Model	Power	Option1	Option2	Option3	Others
M40 -	**A** -	**H** -	**---** -	**---** -	**---** -	**---**
		-H *(85-265 Vac/dc)* -L *(11-60 Vdc and 24/48 Vac)*	-R1 *(1 relay)* -AO *(Analogue output)* *-(empty)*	-R1 *(1 relay)* -AO *(Analogue output)* *-(empty)*	-R1 *(1 relay)* -AO *(Analogue output)* *-(empty)*	-65 *(IP65)* *-(empty)*

Precautions on installation

Risk of electrical shock. Instrument terminals can be connected to dangerous voltage.

Instrument protected with double isolation. No earth connection required.

Instrument is in conformity with CE rules and regulations. See “CE Declaration of Conformity” further in this document.

This instrument has been designed and verified according to the 61010-1 CE security regulation, and is designed for applications on industrial environments. See the “CE Declaration of Conformity” further in this document for information on the category of measure and the degree of pollution levels that apply.

Installation of this instrument must be performed by qualified personnel only. This manual contains the appropriate information for the installation. Using the instrument in ways not specified by the manufacturer may lead to a reduction on the specified protection level. Disconnect the instrument from power before starting any maintenance and / or installation action.

The instrument does not have a general switch and will start operation as soon as power is connected. The instrument does not have protection fuse, the fuse must be added during installation.

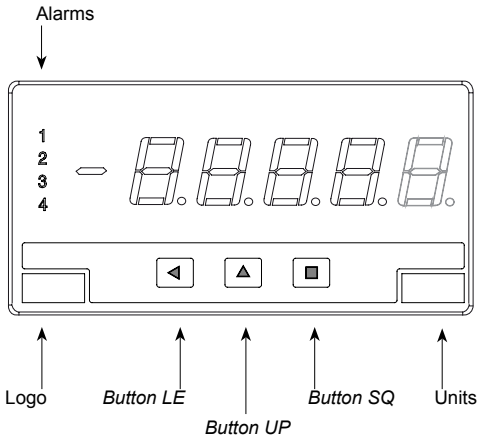
The instrument is designed to be panel mounted. An appropriate ventilation of the instrument must be assured. Do not expose the instrument to excess of humidity. Maintain clean by using a humid rag and do NOT use abrasive products such as alcohols, solvents, etc.

General recommendations for electrical installations apply, and for proper functionality we recommend : if possible, install the instrument far from electrical noise or magnetic field generators such as power relays, electrical motors, speed variators, ... If possible, do not install along the same conduits power cables (power, motor controllers, electrovalves, ...) together with signal and/or control cables.

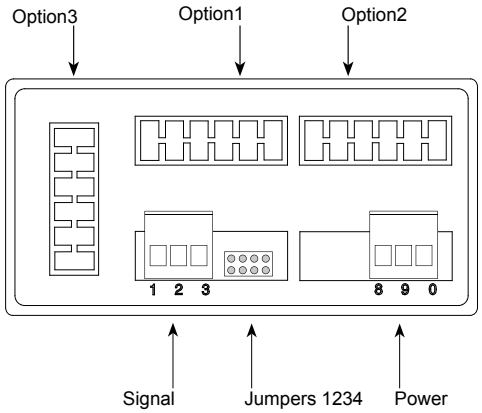
Before proceeding to the power connection, verify that the voltage level available matches the power levels indicated in the label on the instrument.

In case of fire, disconnect the instrument from the power line, fire alarm according to local rules, disconnect the air conditioning, attack fire with carbonic snow, never with water.

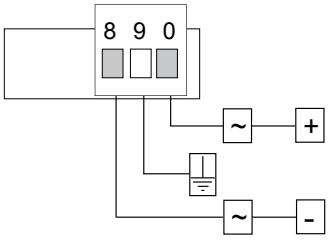
Front View



Rear View



Power Connections



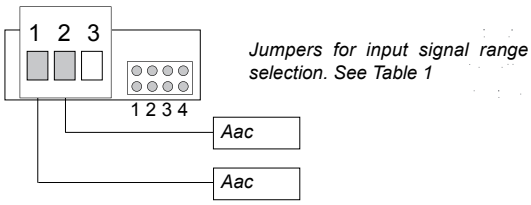
Earth connection - Although a terminal is offered for earth connection, the connection is optional. The instrument does not need this connection for correct functioning nor for compliance with the security regulations.

Fuse - To comply with security regulation 61010-1, add to the power line a protection fuse acting as disconnection element, easily accessible to the operator and identified as a protection device.

Power "H"	fuse 250mA time-lag
Power "L"	fuse 400mA time-lag

Input signal connections - AC Current

The current measuring has a single jumper position. Select the input range in the configuration menu.



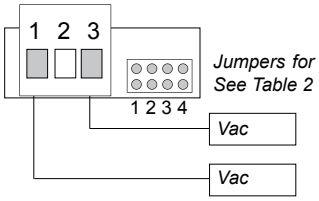
Jumpers for input signal range selection. See Table 1

Range	Close Jumpers	
5 Aac	- - -	
1 Aac	- - -	

Table 1 - AC currents - Input signal range selection

Input signal connections- AC Voltage

To configure the input signal range, select jumpers according to Table 2. Also select the range in the configuration menu.



Jumpers for input signal range selection. See Table 2

Range	Close Jumpers	
600 Vac	- - -	
100 Vac	4	
10 Vac	3	
1 Vac	2	
100 mVac	1	

Table 2 - AC Voltages - Input signal range selection

Coupling "AC Only" or "AC+DC"

To configure the coupling mode (AC or AC+DC) select the internal jumper JP3 as indicated on the Signal Board. See page 10 for information on how to open the instrument.

AC+DC	JP3 closed (by default)
AC Only	JP3 open

Note - The 1 Aac range is only available in AC+DC coupling

Technical Data

Digits	4 (or 5 with last digit fixed to zero)
Type	7 segments, red
Height	14 mm
Display maximum	9999 (99990)
Display minimum	-9999 (-99990)
Decimal point	selectable 8.8.8.8.
Overrange	9999 flashing
Underrange	-9999 flashing
Signals accepted	Vac, Aac
Measure Type	TrueRMS
Coupling	selectable "AC+DC" or "AC Only"
Ranges selectable	600Vac 100Vac 10Vac 1Vac 100mVac 5Aac 1Aac
Connection type	Phase-Neutral or Phase-Phase
Oversignal	+20% of the range
Maximum input signal	see table 3
Minimum input signal	0.5% of range. Reading will be "0" for signals lower than this value.
Input impedance	see table 3 (values at 50/60Hz)
Bandwidth (at 98.85%)	1.3 KHz for Vac ranges 2.0 KHz for Aac ranges
Minimum frequency	25 Hz for ±1 count oscillation
Accuracy at 25ºC	see table 3
Acquisitions	15 acquisitions / second
Display refresh	15 display refresh / second
Step response time	<300mSec (input 0 to 95% FS) <500mSec (input 0 to 50% FS) <1100mSec (input 0 to 10% FS)

The response time for a TrueRMS measuring system is faster for high amplitude signals. Response times are given for input steps of 10%, 50% and 95% of the FS, calculated at 99% of end reading.

Crest Factor	3 for instrument accuracy 5 for 2.5% accuracy

Thermal stability

Offset drift	see table 3
Span drift	see table 3

**span drift includes the offset drift*

Technical Data (cont.)

Power

Power "H"	85 to 265 Vac/dc
Power "L"	11 to 60 Vdc and 24/48Vac
Consumption	<4W
Isolation	3500Veff for power "H" 2000Veff for power "L" all levels tested for 60 seconds
Configuration	3 frontal push buttons (rear jumper for range selection) (internal jumper for coupling selection)

Functions available

Fixed digits	yes, configurable
Filter on display	yes, recursive, configurable
Steps	yes, configurable
Memory of maximum	yes
Memory of minimum	yes
Zeros to the left	yes, configurable
Add zero to the right	yes, configurable
Password	yes, configurable
"Measure" function	yes
Auto correction high	yes
Auto correction low	yes
Peak & Hold	yes
Double setpoints	yes
Brightness control	yes, 5 levels
Optional boards	maximum 3

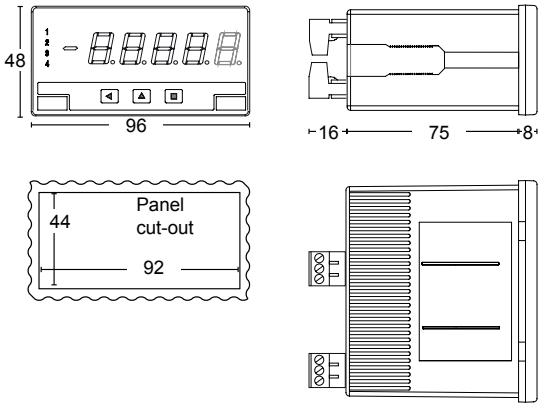
Mechanical

Mounting	panel
Connections	plug-in screw terminals
Weight	<150 grams
Housing materials	ABS, polycarbonate, vergaflex
Front size	96x48mm
Panel cut-out	92x44mm
Deep from panel	91mm (including terminal)
Protection	IP54 standard IP65 optional (Front sealed. Opening the front breaks the seal)
Temperature Operation	0 to 50ºC
Temperature Storage	–20 to +70ºC
Warm-up	15 minutes

Range	*Accuracy*	*Zin*	*Max. Input Signal*	*Offset drift*	*Span drift** **includes offset drift*
600 Vac	*0.25% FS*	*14MOhm*	*1000Vac permanent*	*150 ppm/ºC*	*200 ppm/ºC*
100 Vac	*0.15% FS*	*2MOhm*	*200Vac permanent*	*75 ppm/ºC*	*100 ppm/ºC*
10 Vac	*0.15% FS*	*200K*	*200Vac permanent*	*75 ppm/ºC*	*100 ppm/ºC*
1 Vac	*0.15% FS*	*20K*	*65Vac permanent*	*75 ppm/ºC*	*100 ppm/ºC*
100 mVac	*0.20% FS*	*1K*	*4.5Vac permanent*	*75 ppm/ºC*	*150 ppm/ºC*
5 Aac	*0.20% FS*	*20mOhm*	*16Aac @5 sec.*	*75 ppm/ºC*	*150 ppm/ºC*
1 Aac	*0.20% FS*	*20mOhm*	*16Aac @5 sec.*	*75 ppm/ºC*	*150 ppm/ºC*

Table 3 - Input signal range specifications

Mechanical Dimensions (mm)



Information Menu - Operation

To enter the *"Information Menu"* press the SQ button. The *"Information Menu"* allows to visualize information and does not allow to modify the configuration of the instrument. It is not affected by the "PASSWord" function. During operation with the *"Information Menu",* alarms remain "frozen" and are kept on-hold. Leaving the *"Information Menu"* returns to the measuring state of the instrument, without restart.

Information Menu Tree - See page 5.

Rollback - After 30 seconds without interaction from the operator, the instrument leaves the *"Information Menu"*.

Button SQ - Selects the visible option.

Button UP - Moves vertically along the available menu options.

Button LE - Leaves selected menu or leaves the *"Information Menu"*.

Information Menu - Description

Configuration (Conf) - Information on the configured input signal range (600V, 5A, ...), and the values for input low "ILo", display low "dLo", input high "IhI" and display high "dhI".

Maximum (MAX) - Value of the maximum display.

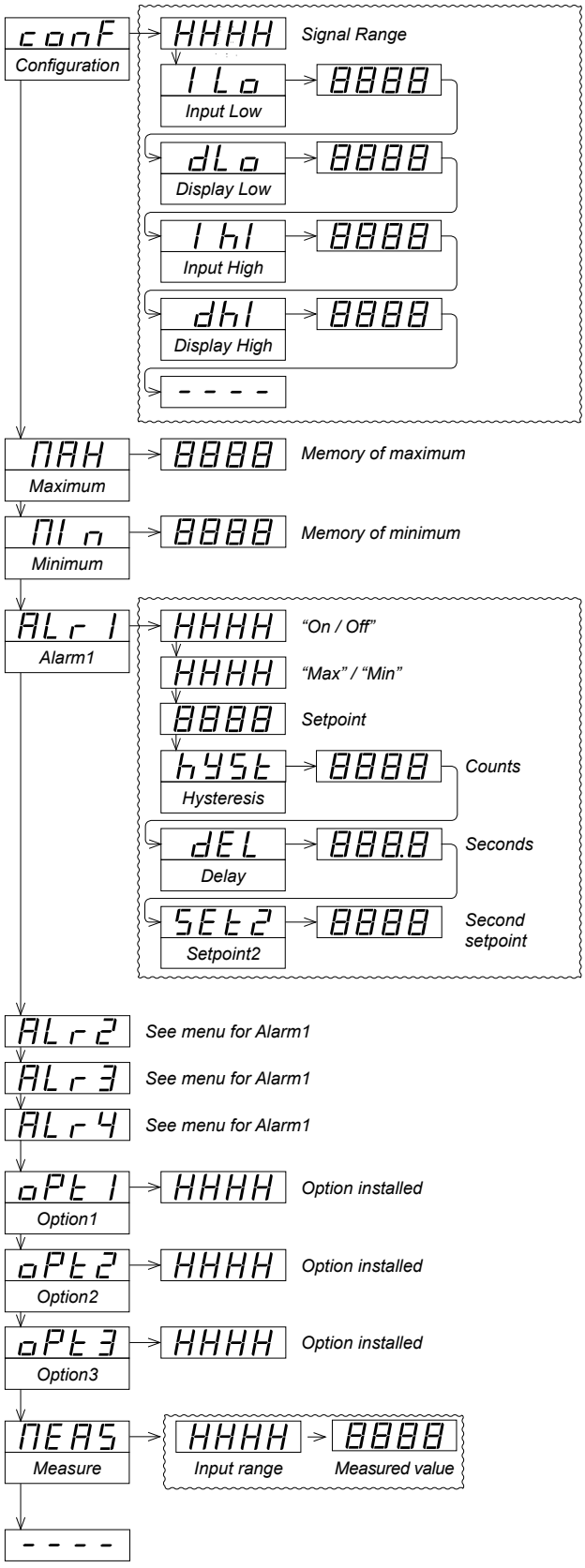
Minimum (Mln) - Value of the minimum display.

AlarmX (ALX) - Configuration of alarm X. The sequence of information shows if the alarm is being managed ("On/Off"), the alarm type ("Max/Min"), the setpoint, the hysteresis value, the activation delay and the value of setpoint2 ("Off" or the setpoint2 value).

OptionX (OptX) - Type of module installed. If there is no module shows "nonE".

Measure (MEAS)- Multimeter function. Shows the value of the input signal without scaling. This is the real value the instrument is receiving on signal terminals.

Information Menu



Configuration Menu - Operation

To enter the *"Configuration Menu"* press the SQ button. The *"Configuration Menu"* allows to change the configuration of the instrument. Access to the *"Configuration Menu"* can be password protected with the function "PASSWord". During operation with the *"Configuration Menu"* the alarms are kept "*on-hold*". When leaving the *"Configuration Menu"* the instrument performs a restart, and new configuration is applied. During the restart of the instrument, a short alarm deactivation is performed.

Configuration Menu Tree - See page 6 and 7.

Description of Configuration Menu functions - See page 8 and 9.

Rollback - After 30 seconds without interaction from the operator, the instrument leaves the *"Configuration Menu"*, discarding all changes.

Button SQ - Moves horizontally on the menu. Allows selection of the current option displayed. During a value selection menu (for example a setpoint value) validates the value on display.

Button UP - Moves vertically on the menu. Displays the available menu options. During a value selection menu (for example a setpoint value) increases digit value from 0 to 1, 2, 3, 4, 5, 6, 7, 8, 9.

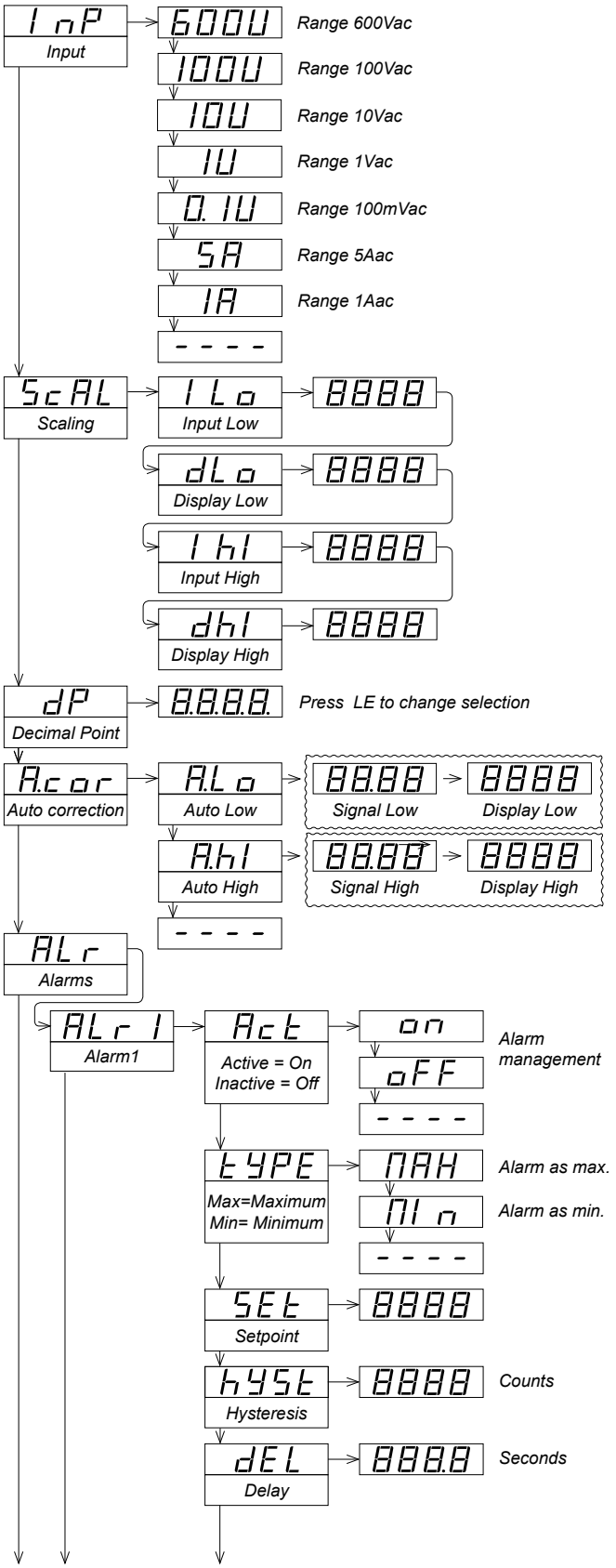
Button LE - Leaves the current menu. Pressing LE several times will leave all menus and leave the *"Configuration Menu"* tree. During a value selection menu (for example a setpoint value) allows to select each digit for modification with the UP button.

Reset - Leaving the *"Configuration Menu"* forces a restart of the instrument, even in case of no changes in configuration.

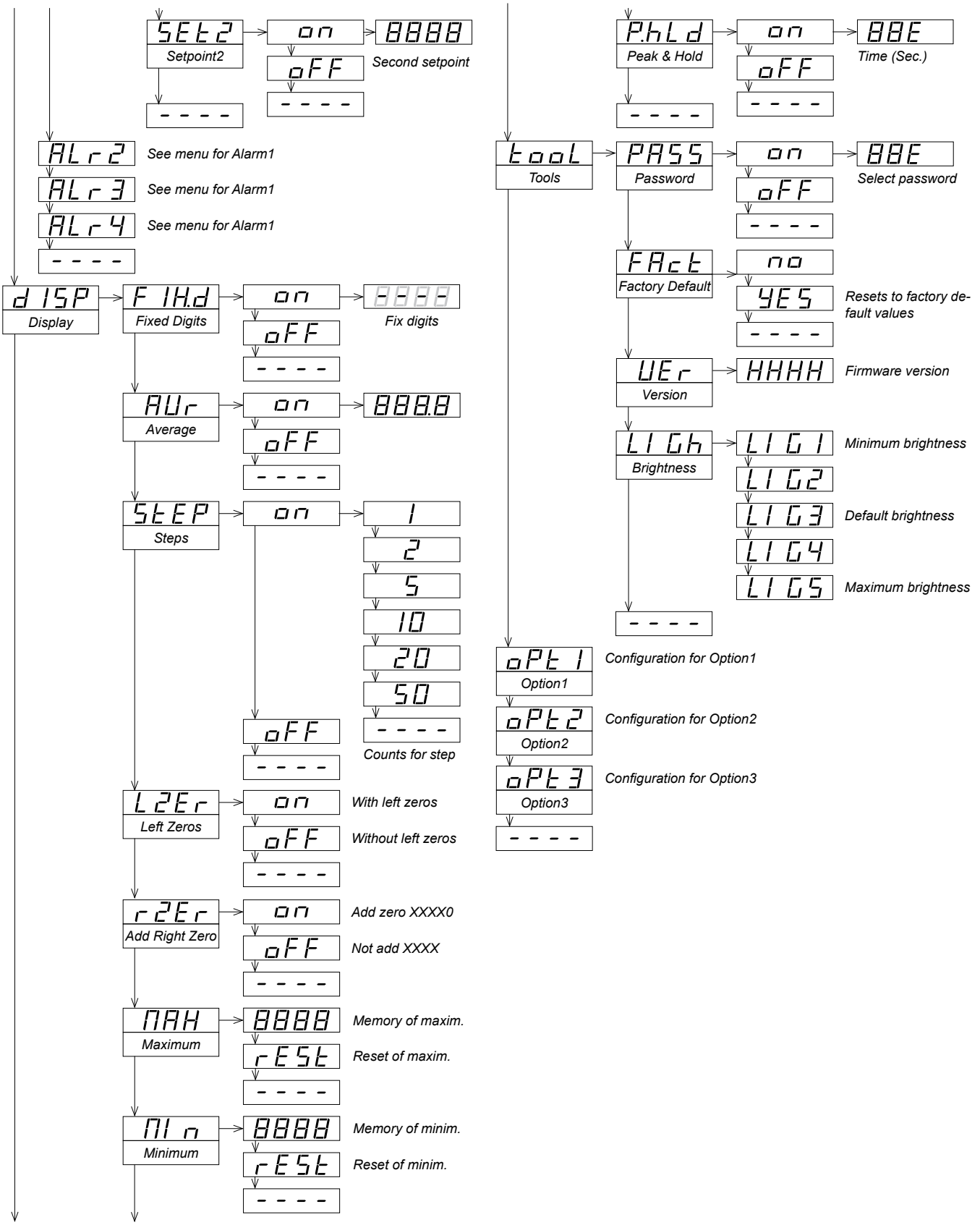
Default factory configuration

Range and scaling	0/600Vac = 0/600.0
Decimal point	XXX.X
Alarms 1,2,3 and 4	
Active	Off (not managed)
Type	maximum
Setpoint	1000
Hysteresis	0 counts
Delay	0.0 seconds
Setpoint2	Off
Display	
Fixed digits	Off
Average	Off
Steps	Off
Left zeros	Off
Add zero to the right	Off
Memory of maximum	-9999
Memory of minimum	9999
Peak & Hold	Off
Tools	
Password	Off
Brightness	3

Configuration Menu



Configuration Menu



Input Menu

The input menu selects the input signal range. Options available are 600Vac, 100Vac, 10Vac, 1Vac, 100mVac, 5Aac and 1Aac.

Jumpers “1234” at the rear of the instrument must be closed according to the range selected. Otherwise, the display will show erratical behavior.

Scaling Menu

The display scaling is based on 4 parameters. These parameters define the two points of the straight line “signal / display”.

Input Low (“ILo”)	Signal input low
Display Low (“dLo”)	Display low
Input High (“Ihl”)	Signal input high
Display High (“dhl”)	Display high

Decimal Point Menu

Select the position for the decimal point. Modify with the LE button and validate with the SQ button.

Auto Correction Menu

Assigns the current input signal value to the Input Low or Input High configuration parameters. The new values for Input and Display are displayed.

Auto Low (A.Lo) - Select “A.Lo” to set the current input signal value to the Input Low configuration parameter.

Auto High (A.hl) - Select “A.hl” to set the current input signal value to the Input High configuration parameter.

AlarmX Menu

The instrument manages up to 4 alarms. Each alarm is controlled by the condition “display higher (or lower) than the configured setpoint”. The front leds are controlled by the activation / deactivation of the related alarm. The relays installed on Option1, Option2 and Option3 are controlled by alarms 1, 2 and 3.

Active (Act) - Value “On/Off”. Defines if the instrument has to manage this alarm or not. Select “Off” for alarm not managed.

Type (tyPE) - Value “Max/Min”. Defines the behavior of the alarm as maximum or minimum alarm. The alarms configured as maximum are activated when the display value is equal or higher than the setpoint. The alarms configured as maximum are deactivated when the display is lower than the setpoint. The alarms configured as minimum have the inverse behavior.

Setpoint (SEt) - Value from “9999” to “-9999”. Alarm set point.

Hysteresis (hySt) - Value from “0” to “9999”. Points of hysteresis. The hysteresis applies on the deactivation of the alarm.

Delay (dEL) - Value from “0.0” to “99.9” seconds. Delay to be applied to the relay activation and deactivation. Relays are activated and deactivated X seconds after the activation / deactivation of the alarm. The delay affects only to the relays. The delay does not affect to the front leds.

Setpoint2 (SEt2) - Value from “-9999” to “9999”. Second setpoint. The second setpoint allows for the creation of activation windows. If the alarm is configured as maximum with setpoint 1000 and setpoint2 is configured at 1500, the alarm will be activated between 1000 and 1500 and the alarm will be deactivated when display is <1000 and >1500. Setpoint2 is affected on the same way as the setpoint with hysteresis and delays.

Display Menu

Functions on this menu allow for configuration of the visualization.

Fixed Digits (FIX.d) - Allows a digit to be fixed to a predefined value (for example, least significant digit fixed to “0”). It is a condition to fix a digit that all digits to its right are also fixed. Value “-” shows that the digit is not fixed.

Average (AVr) - Recursive filter applied to display. Value from “0.0” to “99.9”. The severity of the filter increases with the value selected. Increasing the severity of the filter makes the display response slower.

Steps (StEP) - Display changes on predefined steps. Values are 1, 2, 5, 10, 20 and 50. The display is made in steps of X counts. For example, select a step of 20 will make the display to change in steps of 20 (1420, 1440, 1460, ...).

Left Zero (LZEr) - Value “On/Off”. Select “On” to visualize zeros to the left.

Add Right Zero (rZEr) - Add a zero to the right. Value “On/Off”. Select “On” to light a fifth digit on the display, placed to the right (LSD position) and fixed to a value of “0”. Maximum display reading is now 99990 and minimum -99990.

Maximum (MAX) - Memory of maximum display. Indicates the maximum value of display since the last reset of the memory. Memory is reset on the following cases : manual reset from the Configuration Menu (Maximum), change on the input signal (Input), modification on the scaling (Scaling), change on the decimal point (dP), modification of the linearization segments, or instrument power-down.

Minimum (Mln) - Memory of minimum display. Indicates the minimum value of display since the last reset of the memory. Memory is reset on the following cases : manual reset from the Configuration Menu (minimum), change on the input signal (Input), modification on the scaling (Scaling), change on the decimal point (dP), modification of the linearization segments, or instrument power-down.

Peak & Hold (P.hLd) - Peak & Hold function detects sharp drops in the displayed value, and holds the display if a display drop is detected. To disable the hold function for a moment, press any of the front buttons or wait for a predefined time :

Time 0	hold disabled (Off)
Time 1 a 3999	seconds, before disabling the hold
Time 4000	infinite hold

The counting of seconds is started each time there is an increase in the display value. Alarms will follow the input signal while hold is active.

Tools Menu

Password (Pass) - Select a number to act as password. This password will be requested when entering the Configuration Menu. To deactivate the password select "Off".

Factory Settings (Fact) - Factory default configuration. Select "yES" to activate the factory default configuration.

Version (Ver) - Firmware version installed.

Light (Ligh) - Brightness. Select between 5 predefined levels of brightness.

Options Menu

Menu options OPT1, OPT2 and OPT3 give access to the configuration menus of the installed options. The menu depends on the installed option. If there is no option installed the instrument shows "*nonE*".

Messages and errors

When the instrument detects that the displayed value does not correspond to the expected value, the display will flash and alternate with a message.

"**h.udr**" Hardware underrange. The instrument is reading the lowest possible signal, and can not follow lower signals.

"**h.oVr**" Hardware overrange. The instrument is reading the highest possible signal and can not follow higher signals.

"**d.udr**" Display underrange. The instrument is displaying the minimum value (-9999) and can not display below.

"**d.oVr**" Display overrange. The instrument is displaying the maximum value (9999) and can not display above.

"**hoLd**" The instrument is showing the value present when the hold function was activated. Hold function is active.

"**Min**" The instrument displays the minimum displayed value in memory. The minimum visualization is active.

"**MAX**" The instrument displays the maximum displayed value in memory. The maximum visualization is active.

"**P.hLd**" The instrument displays the peak value. Function Peak&Hold is active.

Err.0 Values introduced on the "ScAL" menu are not valid. Default values are activated. The slope defined by the two points is almost vertical (higher than 5000):

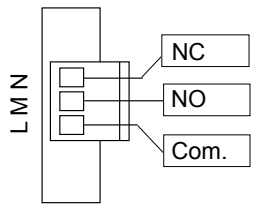
Err.1 Password incorrect.

Err.2 The instrument has detected an installed option but was unable to communicate.

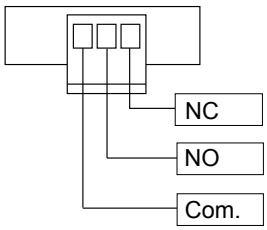
Option R1 - 1 relay

Relay type	3 contacts (Common, NC, NO)
Maximum current	8A (resistive load)
Voltage	250 Vac continuously
Instalable in	Option1 and/or Option2 and/or Option3

Connections for Option3



Connections for Option1 and 2



Warranty

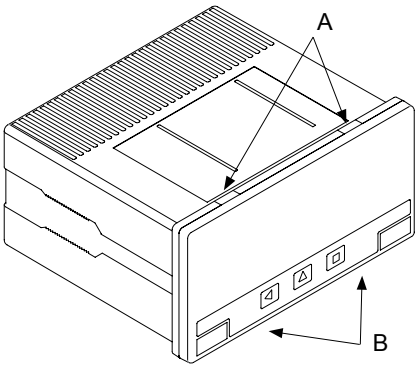
All instruments are warranted against all manufacturing defects for a period of 24 MONTHS from the shipment date. This warranty does not apply in case of misuse, accident or manipulation by non-authorized personnel. In case of malfunction get in contact with your local provider to arrange for repair. Within the warranty period and after examination by the manufacturer, the unit will be repaired or substituted when found to be defective. The scope of this warranty is limited to the repair cost of the instrument, not being the manufacturer eligible for responsibility on additional damages or costs. .

Accessing the instrument

You may need to access the inside of the instrument to insert additional options. Use a flat screwdriver to unlock the upper clips marked with “A”. Then unlock the lower clips marked with “B” and move out the front filter. Let the inside of the instrument slide out of the housing.

To reinsert the instrument make sure that all modules are correctly connected to the pins on the display module. Place all the set into the housing, assuring that the modules correctly fit into the internal guiding slides of the housing. Once introduced, place again the front filter by clipping first the upper clips “A” and then the lower clips “B”.

Important - If your instrument was delivered with the IP65 front seal option, accessing the inside of the instrument will permanently break the IP65 seal on the areas of clips “A” and “B”.



CE Declaration of Conformity

Manufacturer FEMA ELECTRÓNICA, S.A.
Altimira 14 - Pol. Ind. Santiga
E08210 - Barberà del Vallès
BARCELONA - SPAIN
www.fema.es - info@fema.es

Products - M40-A

The manufacturer declares that the instruments indicated comply with the directives and rules indicated below.

Directive of electromagnetic compatibility 2004/108/CEE
Directive of low voltage 73/23/CEE

Security rules 61010-1
Equipment “Fixed”
“Permanently connected”
Pollution degree 1 and 2 (without condensation)
Isolation Double
Category CAT-III up to 300Vac
CAT-II up to 600Vac

Emission rules
61000-6-4 Generic rules of emission

Immunity rules
61000-6-2 Generic rules of immunity
61000-4-2 By contact ±4KV - Criteria B
On air ±8KV - Criteria B

61000-4-3 Criteria A
61000-4-4 On AC power lines: ±2KV - Criteria B
On DC power lines: ±2KV - Criteria B
On signal lines : ±1KV - Criteria B

61000-4-5 Between AC power lines ±1KV - Criteria B
Between DC power lines ±0.5KV - Criteria B

61000-4-6 Criteria A
61000-4-8 30A/m at 50Hz - Criteria A
61000-4-11 0% 1 cycle Criteria A
40% 10 cycle Criteria B
70% 25 cycle Criteria B
0% 250 cycle Criteria B

Barberà del Vallès September 2011
Daniel Juncà - Quality Manager